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The interplay between non-oil tax revenues and government expenditure and its influence on Algeria's long-term economic growth: An econometric analysis

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Abstract:

This study looks at how government spending (GE) and non-oil tax revenues (NTR) affect Algeria's economic growth between 2000 and 2023, with an emphasis on how they interact (NTR_GE). The Autoregressive Distributed Lag (ARDL) model is used in the study to examine both short-term and long-term correlations between the variables.

The short-term results show that non-oil tax revenues and government spending both have a negative and significant impact on economic growth, but their interaction has a positive effect, suggesting that the short-term contractionary effect of taxes can be lessened by reinvesting tax revenues through government spending. Government spending has a long-term beneficial impact on GDP while non-oil tax receipts are negligible. The interplay between revenues and government spending is negative, underscoring the significance of effectively allocating public spending.

To promote sustainable economic growth, the report suggests increasing the effectiveness of fiscal policy and carefully broadening the non-oil tax base.

Keywords: Non-oil tax revenue, Government expenditure, Economic growth, Algeria, ARDL model.

JEL Classification: H2, H5, O4, C32.

1. Introduction:

Public finance and development economics continue to place a strong emphasis on the role of fiscal considerations in fostering economic growth, especially for resource-rich nations that must both manage unstable hydrocarbon income and advance sustainable development. An example of this is Algeria, where non-hydrocarbon tax revenues are underutilised despite their potential to promote economic diversification and improve fiscal stability due to the country's heavy reliance on oil and gas for government revenue. A continuous non-hydrocarbon tax deficit of 2-4% of GDP, according to recent estimates by the International Monetary Fund, is caused by a restricted tax base, poor value-added and corporate income tax performance, and structural limitations, such as a sizable informal economy (Vellutini, 2025).

The disparate impacts of fiscal measures on growth in Algeria are highlighted by empirical research. Short-term economic performance has been found to be negatively impacted by non-oil tax collections (Meslem, Lazazi, & Djerbal, 2024), but public spending typically promotes long-term growth and output expansion (Mennad & Meskini, 2025). Additionally, current research highlights the potential for differing short- and long-term results from the interaction between tax revenues and government spending, highlighting the need for approaches that can capture these dynamic interactions (Pesaran, Shin, & Smith, 2001).

Despite these observations, little empirical study has explicitly looked at the combined impact of government spending and non-oil tax revenues on Algeria's economic growth, with a focus on differentiating between short-term volatility and long-term equilibrium impacts. In light of ongoing measures intended to increase the non-hydrocarbon tax base, strengthen fiscal resilience, and promote economic diversification in the face of unstable oil markets, this research gap is particularly pertinent.

Thus, the main aim of this study is to determine how government spending and non-oil tax income, both separately and in combination, impact Algeria's economic growth between 2000 and 2023. The paper provides a thorough evaluation of the influence of fiscal policy in Algeria's growth trajectory by examining both short-term dynamics and long-term relationships using the Autoregressive Distributed Lag (ARDL) framework.

2. Literature review:

The relationship between non-oil income and economic growth has been the subject of numerous research, especially in resource-dependent nations. However, the econometric approaches, time periods, and economic contexts used in these studies vary. Numerous studies have examined the effect of non-oil tax revenues on Nigeria's economic expansion. Value-added tax, corporate income tax, and customs duties are examples of non-oil taxes that have a positive and significant impact on economic growth between 1994 and 2017, according to a study by Adegbie, Nwaobia, and Osinowo (2020). This highlights the significance of increasing the effectiveness of the tax system. Similarly, Ndu and Uguru's (2022) analysis, which employed the OLS model, demonstrated that non-oil tax revenues favourably impacted Nigeria's economic growth from 2001 to 2021.

In similar lines, the study conducted by George, Monday, and Chukwu (2022) found that corporate income tax and GDP had a positive and significant association, but personal income tax and economic growth had a positive but statistically insignificant link. Furthermore, Owuru and Olabisi's (2020) analysis indicated that non-oil tax revenues had a stronger beneficial impact than oil revenues on attaining inclusive and pro-poor growth.

However, the findings of several investigations have been conflicting. Using the ARDL model, Oghuma, Eluyela, and Iyoha's (2022) study discovered that while corporate income tax and customs duties have a positive long-term influence on economic growth, value-added tax and personal income tax have a negative one. In a similar vein, the study conducted by Otekunrin et al. (2023) discovered that while some taxes have a favourable impact on economic growth, others, such as corporate income tax and value-added tax, may have a detrimental impact.

Employing a Panel GLS model, the study by Eze (2023) examined the effects of non-oil tax collections in a number of African nations, including Burkina Faso, Ghana, Nigeria, Mali, and Togo. The findings showed that property taxes and capital gains taxes significantly and favourably influence economic growth.

In contrast, some research concentrated on the connection between government spending, non-oil earnings, and economic expansion. According to Olayungbo and Olaniyan's (2018) research, government spending has a detrimental effect on Nigeria's economic growth, whilst non-oil income have a favourable effect. Similarly, the study conducted in Bahrain by Kreishan, Abdelbaki, and Karaki (2023) found that while non-oil revenues affect the economy's reaction to shocks, government spending is the primary driver of economic development. Olaoye and Oladapo (2025) looked at the effect of non-oil tax collections on ongoing government spending in Nigeria. The findings demonstrated that while the impact of some other taxes was negligible or statistically unimportant, value-added taxes constitute a significant source of funding for government spending.

In a worldwide comparative framework, Gurdal, Aydin, and Inal's (2021) study in the G7 countries discovered causal links between tax collections, government spending, and economic growth, highlighting the importance of fiscal policy in ensuring economic stability.

Shili and Panjwani (2020) conducted a research in oil-dependent countries to examine the impact of non-oil tax revenues and non-oil non-tax revenues on economic growth in Saudi Arabia. The results showed a considerable positive link between both categories of revenue and nominal GDP.

At the Algerian level, Mennad and Meskini (2025) investigated the influence of government spending on economic development from 1999 to 2022. The findings demonstrated a significant positive association between government spending and economic development, supporting the importance of fiscal policy in boosting economic activity.

While these studies have made substantial contributions, there remain numerous voids of research that the current research seeks to fill:

The majority of the empirical studies have focused on Nigeria, other African nations, or advanced economies, however, very few econometric studies exist between non-oil taxes

collected, government expenditures, and economic growth in Algeria. Most prior studies examined the direct effects of non-oil tax revenue on economic growth, very few studied how non-oil tax revenue and government expenditures interacted to influence economic growth.

Additionally, the results from prior studies are inconsistent, some studies suggest a positive correlation between Non-oil Revenue and Economic Growth while others indicate a negative correlation based solely on the design of the tax code. Therefore, through further investigations, it will be better able to determine how this relationship continues to exist under varying economic conditions.

Most studies have employed econometric models including OLS, FMOLS, and VECM, however, this study will utilize an ARDL model, which will allow for an analysis of both the short-run as well as the long-run relationships between the variables.

Finally, like other countries with abundant natural resource wealth, the Algerian economy is considered to be a rentier economy that relies heavily on oil and gas revenue as its primary source of income, therefore, the examination of non-oil tax revenues is particularly significant in the context of attempts to diversify national income sources and support sustainable economic growth.

3. Methodology:

In order to investigate how government spending acts as an intermediary between oil-free tax revenues and economic growth in Algeria over the period of 2000-2023, an empirical econometric approach is adopted.

3.1 Data sources, variables, and measurement:

In this study, an annual dataset from 2000-2023 has been used. The data has been obtained from reliable sources such as the World Bank and the Ministry of Finance in Algeria. The dependent variable is GDP Per Capita which is the measure for the overall performance of the Algerian economy. Government expenditure is used as an intermediary variable; Non-Oil Tax Revenues are considered the independent variable (non-oil tax revenues). An interaction term (NTR_GED) was created in this research to measure the interactive effects of all fiscal policy components. This interactive variable shows how government expenditure reinforces or moderates the effects of non-oil tax revenues on per capita economic growth, and the level of the effect of each variable depends on the level of other variable(s) (Göksu & Ergun, 2013). A summary of those variables used in this analysis is shown below:

Table 1. Study Variables (Type, Source and Measurement)

Variable	Type	Source	Measurement
Economic growth (GDP per capita)	Dependent variable	(World Bank, 2024)	Measured in billion Algerian dinars (DZD).
Non-oil tax revenue (NTR)	Independent variable	Ministry of Finance, Algeria	Measured in billion Algerian dinars (DZD).
Government expenditure (GE)	Mediating variable	(World Bank, 2024)	Measured in billion Algerian dinars (DZD).

Interaction term (NTR_GE)	Interaction variable	Developed by the authors using EViews 12	Calculated as the product of non-oil tax revenue and Government expenditure

Source: Prepared by the author.

3.2 Econometric Approach and Estimation Strategy:

The purpose of this study was to create an econometric model to examine how non-oil tax revenue and government spending correspond to economic growth in Algeria from 2000 to 2023; therefore, the data collected in this study were used to create an econometric model. The data was analyzed using the ARDL method as implemented in EViews 12. According to Pesaran et al. (2001), the ARDL method provides an analysis of both short-term and long-term relationships among various variables because they can be integrated into multiple orders (I(0) or I(1)).

In this paper, the ARDL model, which offers advantages including the ability to identify the correct lag structure of the variables, account for dynamic adjustment over time, and to provide reliable results from small samples, is deemed to be appropriate for annual time series data in this study. These characteristics of the ARDL approach enable it to function effectively as a tool to explore how government expenditures moderate the relationship between non-oil tax revenues and economic growth in Algeria. The steps of the ARDL methodology will be followed in conducting the empirical analysis:

First, conducting a stationarity test such as the Augmented Dickey-Fuller (ADF) or Phillips-Perron (PP) test in order to confirm whether the variables are either I(0) or I(1). Second, identifying the optimal lag length for each variable using the Akaike Information Criterion (AIC). Third, examining whether there is a long-term association between the variables using the Bounds Test for cointegration. If cointegration exists, using the long-run coefficients estimated earlier to build the Error Correction Model (ECM) and capture the short-run effects. Finally, conducting diagnostics tests to confirm the reliability of the model and evaluate the stability of the estimated parameters over time using CUSUM and CUSUMSQ tests.

4. Results analysis:

The ARDL approach is utilized to investigate the government's spending on the relationship between non-oil tax revenue and economic growth in Algeria between the years 2000 and 2023. In this section, we will show the empirical results of this study along with their interpretation. After beginning with a unit root test to establish the properties of stationarity and the order in which the variables are integrated, we then test for whether a long-run relationship exists between non-oil tax revenues, government spending, and economic growth.

Once cointegration is confirmed, we estimate long-run coefficients to represent the structural relationships among those variables and apply Error Correction Models (ECMs) to assess short-run dynamics. Moreover, we perform a series of diagnostic tests and stability tests to assess the validity, stability, and reliability of the estimated models.

4.1 Stationarity test:

Before applying the ARDL model, it is necessary to test the stationarity of the time series variables, since this approach requires that all variables be integrated at I(0) or I(1) but not I(2). In this study, the stationarity of the variables was examined using the Phillips-Perron (PP) test (Phillips & Perron, 1988) and the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979).

If a variable is found to be non-stationary at level, it is tested again after taking the first difference until stationarity is achieved. The main results of the stationarity tests are summarized in the table below.

Table 2. Results of the ADF and PP unit root tests

Test	Variable	Level I(0)	First Diff I(1)	Integration Order
ADF	Economic growth (GDP per capita)	Non stationary (p = 0.1092)	Stationary (p = 0.0088)	I(0)
	Non-oil tax revenue (NTR)	Non stationary (p = 0.4095)	Stationary (p = 0.0176)	I(1)
	Government expenditure (GE)	Non stationary (p = 0.8275)	Stationary (p = 0.0086)	I(1)
	Interaction term (NTR_GE)	Non stationary (p = 0.4566)	Stationary (p = 0.0102)	I(1)
PP	Economic growth (GDP per capita)	Non stationary (p = 0.4582)	Stationary (p = 0.0294)	I(1)
	Non-oil tax revenue (NTR)	Non stationary (p = 0.5070)	Stationary (p = 0.0178)	I(1)
	Government expenditure (GE)	Non stationary (p = 0.9393)	Stationary (p = 0.0080)	I(1)
	Interaction term (NTR_GE)	Non stationary (p = 0.6873)	Stationary (p = 0.0117)	I(1)

H_0: Variable has a unit root.
Note: The test includes both trends and constants; AIC was used to determine the lag length.

Source: Prepared by the author based on EViews 12 software output.

The results of the ADF and PP unit root tests indicate that all the variables studied were non-stationary at their levels but became stationary after taking the first difference, meaning they are integrated of order one I(1). This implies that the variables are suitable for applying the ARDL model, which allows for variables to be either I(0) or I(1), but not I(2), making them appropriate for analyzing the relationship between non-oil tax revenues and economic growth with the mediating role of government expenditure.

4.2 Selecting the optimal ARDL model:

Selecting the appropriate number of lagged periods for an ARDL model is crucial, as it directly affects the validity of dynamic responses and the reliability of the estimated relationships (Enders, 2010). In this study, the optimal lag length was determined using standard information criteria, including the Akaike Information Criterion (AIC), the Schwarz Bayesian Criterion (SBC), and the Hannan-Quinn Criterion (HQ). Most criteria indicated that the third lag is the most suitable. The results of the lag selection process are summarized in the following table.

Table 3. Criteria for lag order selection.

Lag	LogL	LR	FPE	AIC	SBC	HQC
0	-761.6955	NA	5.50e+26	72.92338	73.12234	72.96656
1	-645.2182	177.4893	3.99e+22	63.35411	64.34890	63.57001
2	-620.9922	**27.68686***	2.22e+22	62.57069	64.36130	62.95929
3	-594.7945	19.96019	**1.53e+22***	**61.59947***	**64.18591***	**62.16079***

(*) Optimal lag.

Source: Prepared by the author based on EViews 12 software output.

4.3 Co-integration test:

In time series econometric analysis, cointegration testing is a critical step, particularly when the variables are integrated at different orders. Accordingly, this study employs the Bounds Testing approach developed by Pesaran et al. (2001) to examine whether non-oil tax revenues (NTR), government expenditure (GE), their interaction term (NTR_GE), and economic growth (GDP per capita) exhibit a long-run equilibrium relationship. This approach is appropriate given the mixed order of integration (I(0) and I(1)) of the variables. Establishing cointegration enhances the robustness and reliability of the ARDL model results, confirming the presence of stable long-term relationships among the variables. The outcomes of the cointegration test are presented in the table below.

Table 4. Results of the ARDL bounds test

Test Statistic	Value	Bounds of Critical Values (at 5% level)	Decision
F-statistic	19.24610	I(0) = 2.79 I(1) = 3.67	There is cointegration

H_0: There is no cointegration, and no relationship.

Note: A long-term cointegration relationship is indicated by the F-statistic exceeding the upper bound at the 5% significance level.

Source: Prepared by the author based on EViews 12 software output.

The result of the ARDL bounds test for cointegration is presented in Table 4. The calculated F-statistic was compared with the critical value. The F-statistic (19.24610) exceeds the upper bound of the critical value (3.67) at the 5% significance level. Therefore, the null hypothesis of no long-run relationship is rejected, confirming the existence of a strong and stable long-run cointegration relationship among the model's variables.

4.4 Long and short-term Estimation and Error Correction:

Table 5 presents the results of the short and long-run model for the relationship between economic growth (GDP per capita) and government expenditure (GE), non-oil tax revenues (NTR), and the interaction term (NTR_GE), including the estimated values for each variable, their statistical significance, as well as the Error Correction Term (ECT) and the model's R-squared.

Table 5. Long and short-term estimation results for ARDL

Dependent Variable: GDP_PC Selected Model: ARDL (1, 3, 1, 3)			
Variable	**Coefficient**	**p-Value**	**Significance**
Short Run			
GE	-0.126417	0.0123	Significant (-)
NTR	-0.463232	0.0169	Significant (-)
NTR_GE	6.21E-05	0.0013	Significant (+)
Long Run			
ECT	-0.935402	0.0000	Significant; fast adjustment to equilibrium
GE	0.117404	0.0013	Significant (+)
NTR	0.145350	0.3567	Non significant (+)
NTR_GE	-2.66E-05	0.0250	Significant (-)
R-squared		0.996492	

Source: Prepared by the author based on EViews 12 software output.

Table 05 presents the short-run and long-run results of the ARDL model examining the effects of government expenditure, non-oil tax revenues, and their interaction on economic growth in Algeria. The table summarizes the estimated coefficients, their statistical significance, and the error correction term, providing a comprehensive overview of both immediate and long-term impacts of fiscal variables on the Algerian economy. The following section interprets these results in detail, separating short-run and long-run effects.

- **Interpretation of the Short-Run Results:**

- **Non-oil Tax Revenues (NTR):** The results show that non-oil tax revenues have a negative and statistically significant effect on economic growth in the short run, with a coefficient of (-0.463). This can be explained by the contractionary effect of taxes in the short term, as increases in taxes and fees imposed on individuals and firms may reduce purchasing power and corporate profits, leading to lower consumption and private investment. This effect becomes more evident in the Algerian economy, which has historically relied more on oil tax revenues than on ordinary taxation. Consequently, any increase in non-oil taxes may represent a relatively heavier burden on economic agents in the short run.

- **Government Expenditure (GE):** The results indicate a negative and statistically significant effect of government expenditure on economic growth in the short run, with a coefficient of (-0.126). This result can be explained by the fact that, in many cases, a considerable portion of government expenditure is directed toward current expenditures such as wages, subsidies, and social transfers. While these expenditures have an important social dimension, they do not generate an immediate productive impact on economic activity. Therefore, an increase in government expenditure in the short run may lead to higher consumption without a corresponding increase in production, which may negatively affect economic growth rates during the same period.

- **Interaction Variable (NTR_GE):** The results indicate a positive and statistically significant effect of the interaction variable in the short run. This suggests that the combination of non-oil tax revenues and government expenditure can support economic growth when tax revenues are directed toward financing public spending. Reinjecting tax revenues into the economy through government expenditure may mitigate the negative impact of taxation on economic activity, particularly when these resources are allocated to projects or programs that stimulate aggregate demand or promote economic activity.
- **Error Correction Term (ECT):** The error correction coefficient reached (-0.935) and is statistically significant, indicating a high speed of adjustment toward equilibrium after any short-run disequilibrium. This value means that approximately 93% of the deviation from long-run equilibrium is corrected within one period, reflecting a strong equilibrium relationship among the studied variables. It also highlights the central role of fiscal policy in the Algerian economy, where changes in public revenues or expenditures can relatively quickly influence economic activity.

Interpretation of the Long-Run Results

- **Non-oil Tax Revenues (NTR):** The results show a positive but statistically insignificant effect of non-oil tax revenues on long-run economic growth. This reflects the limited role of these revenues in the Algerian economy compared to oil tax revenues, which represent the main source of public revenue. Despite government efforts to expand the non-oil tax base, its contribution to financing the general budget remains relatively small compared to oil revenues, making its impact on long-run growth relatively weak.
- **Government Expenditure (GE):** The results indicate a positive and statistically significant effect of government expenditure on economic growth in the long run, with a coefficient of 0.117. This can be explained by the fact that the effects of public spending, especially those related to investment in infrastructure and public services such as education, health, and transportation, take time to materialize. In Algeria, the state plays a major role in financing large-scale projects such as roads, housing, and public facilities. These projects contribute over the long term to improving productivity and providing a favorable environment for economic activity, which is reflected positively on economic growth.

Interaction Variable (NTR_GE): The results indicate a negative and statistically significant effect of the interaction variable on long-run economic growth. This can be interpreted as suggesting that a simultaneous increase in taxes and government expenditure may, over time, create pressures on economic activity if spending is not efficiently allocated to productive sectors. It also reflects the possibility that financing government expenditure through higher taxes could reduce private sector investment incentives, particularly in an economy like Algeria's that seeks to diversify its sources of income and reduce dependence on oil revenues.

The model's R-squared value is 0.996492, which is extremely high, indicating that the independent variables included in the model (non-oil tax revenues (NTR), government expenditure (GE), and their interaction (NTR_GE)) are able to explain approximately

99.64% of the variations in economic growth (GDP per capita) during the study period. This demonstrates a very high explanatory power, as most of the changes in economic growth can be accounted for by variations in these fiscal variables, while only a small fraction (around 0.36%) is attributable to other factors not included in the model. This result also reflects the central importance of fiscal policy in the Algerian economy, where tax revenues and government expenditure play a pivotal role in influencing overall economic activity. Given the Algerian economy's heavy reliance on oil tax revenues to finance public spending, any changes in the structure of revenues or the level of government expenditure can have a clear and significant impact on aggregate economic performance.

4.5 Model validity

To ensure the validity of the estimated econometric model and the reliability of the empirical results, a series of diagnostic tests were conducted. These tests aim to verify that the model satisfies the standard regression assumptions, including no autocorrelation in the residuals, homoscedasticity, normality of residuals, and parameter stability over time. These checks help ensure that the model is well-specified and capable of accurately representing the relationship between economic growth, government expenditure, and non-oil tax revenues in both the short and long run.

Table 6. Model validity result

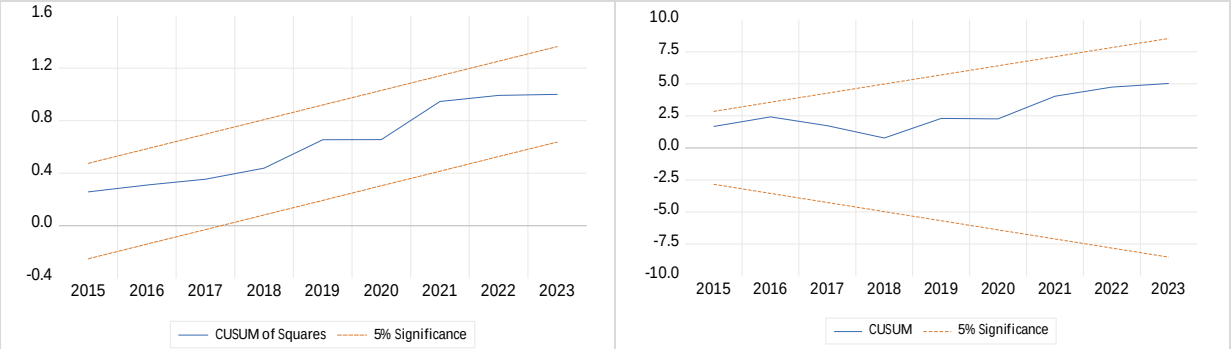
	Test Statistic	Value	p-Value	Decision (at 5%)
Serial correlation LM test (Breusch-Godfrey)	F-statistic	0.44769	0.5223	The absence of serial correlation in the residuals
	H_0: There is no serial correlation in the residuals.			
Breusch-Pagan-Godfrey Heteroskedasticity Test	F-statistic	1.000361	0.5083	No evidence of heteroskedasticity
	H_0: There is no heteroskedasticity in the residuals.			
Normality test (Jarque-Bera)	Jarque-Bera	0.171886	0.917647	The residuals are normal
	H_0: The distribution of residuals is normal.			

Source: Prepared by the author based on EViews 12 software output.

The results in Table 6 indicate that the estimated econometric model satisfies the key diagnostic tests, as the Breusch-Godfrey test showed no serial correlation in the residuals, the Breusch-Pagan-Godfrey test indicated no heteroskedasticity, and the Jarque-Bera test confirmed that the residuals are normally distributed, thereby reinforcing the reliability and accuracy of the model.

In addition, the stability tests (CUSUM and CUSUMSQ) showed that the model remained structurally stable throughout the sample period, with no abrupt changes in variance or significant fluctuations in the model's coefficients, thereby reinforcing the reliability and accuracy of the model in representing the relationship between economic growth, government expenditure, and non-oil tax revenues. The results of these tests are as follows:

Figure 1. CUSUMSQ and CUSUM test results



Source: EViews 12 software output.

The first figure presents the results of the CUSUM and CUSUMSQ tests, which indicate that the ARDL model remained structurally stable throughout the study period. As the test statistics remain within the 5% significance bounds, there are no sudden variance spikes or major parameter instabilities. This confirms that the model's coefficients are stable over time, supporting the expected relationships between non-oil tax revenues, government expenditure, and economic growth in Algeria.

5. Conclusion:

Non-oil tax revenues and government expenditure had both short-term and long-term effects on the economic growth of Algeria, each with a unique relationship to economic activity and together. While government expenditure and non-oil tax revenues (tax revenue from sources other than oil) each have a significant contractionary effect (reduced economic growth), when the two of these variables interact, they can confer a unique mitigating effect that offsets the negative impact of each in the short term. In the long term, the relationship between these two fiscal variables reverses direction due to their contributing to economic growth over the long term. Furthermore, when interactions occur, it has a net negative effect on economic growth if the current spending from increased taxation is not allocated efficiently to incentivize private sector activity.

The study highlights how important fiscal policy will be in facilitating Algeria's economic performance. Investing in government spending can create long-term growth for the country. However, because of their lack of relationship with one another, non-oil taxes will only be as valuable as how well they are combined together with the proper expenditure.

Policymakers must therefore focus on doing the following: Improve the efficiency of public expenditure. Cautiously expand the non-oil tax base. Carefully develop a mix of both to encourage long-term, sustainable economic growth and to minimize any interference from private-sector activity.

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